

DURA PULSE

Dynamic Braking Units

User Manual

GS-2DBU

GS-4DBU



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⚡ WARNING ⚡



WARNING: Always read this manual thoroughly before using the *DURAPULSE* Dynamic Brake Unit with the *DURAPULSE* AC Motor Drive.



WARNING: AC input power must be disconnected before performing any maintenance. Do not connect or disconnect wires or connectors while power is applied to the circuit. Maintenance must only be performed by a qualified technician.



WARNING: There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. To avoid damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.



WARNING: A charge may still remain in the AC drive's DC-link capacitor(s) with hazardous voltages even if the power has been turned off to the AC drive. To avoid personal injury, do not remove the cover of the *DURAPULSE* Dynamic Brake Unit or the AC drive until the power has been disconnected from the AC drive and all "DISCHARGE" indicators on the devices are off. Please note that there are live components exposed within the brake unit and the AC drive. Do not touch these live parts.



WARNING: Ground the *DURAPULSE* Dynamic Brake Unit using the ground terminal. The grounding method must comply with the laws of the country where the brake unit is to be installed. Refer to the "Basic Wiring Diagram" shown on page 13.



WARNING: The mounting enclosure of the *DURAPULSE* Dynamic Brake Unit must comply with EN50178. Live parts shall be arranged in enclosures or located behind barriers that meet at least the requirements of the Protective Type IP20. The top surface of the enclosures or barrier that is easily accessible shall meet at least the requirements of the Protective Type IP40. Users must provide this environment for the brake unit and braking resistor.

DURAPULSE

DYNAMIC BRAKE UNIT

USER MANUAL



Please include the Manual Number and the Manual Issue, both shown below, when communicating with Technical Support regarding this publication.

Manual Number: **GS3-DB-M**

Issue: **First Edition, Rev. A**

Issue Date: **03/04**

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Manual Overview

Overview of this Publication

The *DURAPULSE* Dynamic Brake Unit User Manual describes the installation, wiring, configuration, and operation of the dynamic brake unit and braking resistors as used with *DURAPULSE* AC Drives.

Who Should Read This Manual

This manual contains important information for those who will install, maintain, and/or operate any *DURAPULSE* AC Drive that makes use of the dynamic brake unit in their application.

Supplemental Publications

The *DURAPULSE* AC Drive User Manual (GS3-M) is available from AutomationDirect and should be used along with this manual to properly install and operate both the *DURAPULSE* AC drive and the *DURAPULSE* dynamic brake unit.

The National Electrical Manufacturers Association (NEMA) publishes many different documents that discuss standards for industrial control equipment. Global Engineering Documents handles the sale of NEMA documents. For more information, you can contact Global Engineering Documents at:

**15 Inverness Way East
Englewood, CO 80112-5776
1-800-854-7179 (within the U.S.)
303-397-7956 (international)
www.global.ihs.com**

NEMA documents that might assist with your AC drive systems are:

- **Application Guide for AC Adjustable Speed Drive Systems**
- **Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems.**

Manual Overview Cont'd

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Special Symbols



When you see the “notepad” icon in the left-hand margin, the paragraph to its immediate right will be a special note.



When you see the “exclamation mark” icon in the left-hand margin, the paragraph to its immediate right will be a warning. This information could prevent injury, loss of property, or even death (in extreme cases).

Introduction

The *DURAPULSE* Dynamic Brake Units are used with the *DURAPULSE* AC Drives to enable the AC motor and its load to be decelerated more rapidly to zero speed than what normally can be achieved without the brake unit. Applications with high inertia type loads tend to cause the motor to regenerate energy back into the AC drive. This regeneration causes the AC drive's internal DC bus voltage to rise and if left unchecked can cause an over voltage trip. The brake unit is designed to continuously monitor the drive's DC bus voltage and when the voltage exceeds a predetermined level (depending on the supply voltage) the brake unit dissipates the excess energy into an external resistor in the form of heat.

The Dynamic Brake Unit is available in two different voltage classes: 230V or 460V. The brake units can be set up for multiple unit operation using the MASTER/SLAVE configuration that will achieve the power rating required for the larger AC drive and motor combinations.

Unpacking

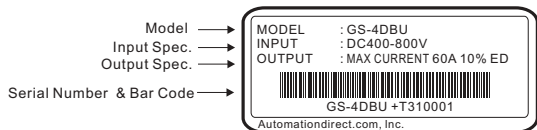
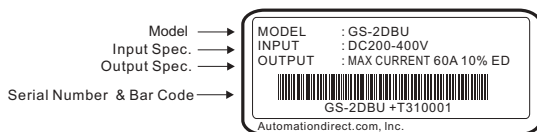
After receiving the *DURAPULSE* Dynamic Brake Unit (GS-2DBU or GS-4DBU), please check for the following:

- Make sure that the part number indicated on the package corresponds with the part number of your order.
- Make sure that the package includes the *DURAPULSE* dynamic brake unit and the *DURAPULSE* Dynamic Brake Unit User Manual.
- Inspect the contents to insure they were not damaged during shipment.

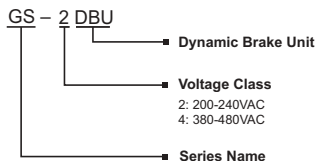
Introduction Cont'd

Nameplate Information:

(Label 2 - see page 9 for location.)



Part Number Explanation:



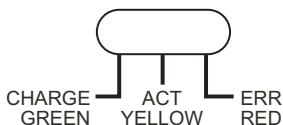
Note: The 10% ED output rating shown on the nameplate is the "Effective Duration" of the Dynamic Brake Unit and can also be referred to as "Duty Cycle".

Specifications

The following table provides the specifications for the *DURAPULSE* Dynamic Brake Unit. Please review these specifications to make sure the unit meets your application requirements.

Dynamic Brake Unit Specifications			
Model		230V Class	460V Class
Part Number		GS-2DBU	GS-4DBU
Max. Motor Capacity HP(KW)		30(22)	60(45)
Output Rating	Max. Peak Discharge Current (A) 10% ED (Duty Cycle)	60	60
	Continuous Discharge Current (A)	20	18
	Braking Start-up Voltage (DC)	330/345/360/380/400/415 \pm 3V	660/690/720/760/800/830 \pm 6V
	Maximum On-Time	60 Seconds	60 Seconds
Input Rating	DC Voltage	200~400 VDC	400~800 VDC
Protection	Heat Sink Overheat	Temperature over +95 °C (203 °F)	
	Alarm Output	Relay contact 5A @ 120VAC/28VDC (RA, RB, RC)	
	Power CHARGE LED (Green)	ON until the bus (P-N) voltage is below 50VDC	
	Braking ACT LED (Yellow)	ON during braking	
	Fault ERR LED (Red)	ON if a fault has occurred	
Usage Environment	Installation Location	Indoor (no corrosive gases, metallic dust)	
	Operating Temperature	-10 °C to +50 °C (14 °F to 122 °F)	
	Storage Temperature	-20 °C to +60 °C (-4 °F to 140 °F)	
	Humidity	90% Non-condensing	
	Vibration	9.8m/s ² (1G) under 20Hz 2m/s ² (0.2G) @ 20~50Hz	
Mechanical Configuration		Wall-mounted enclosed type IP50	

Indicators:



Brake Unit & Braking Resistor Summary

AC Drive		Brake Unit		Braking Resistor				
Voltage Class	AC Drive Part No.	QTY	Brake Unit Part No.	QTY	Resistor Part No.	Resistor Specification for Each Braking Unit	Braking Torque 10% Duty Cycle	Typical Thermal Overload Relay Value
230V	GS3-2020	1	GS-2DBU	1	GS-2020-BR-ENC	3000W 10Ω	125%	30A
	GS3-2025	1		1	GS-2025-BR-ENC	4800W 8Ω	125%	35A
	GS3-2030	1		1	GS-2030-BR-ENC	4800W 6.8Ω	125%	40A
	GS3-2040	2		2	GS-2040-BR-ENC	3000W 10Ω	125%	30A
	GS3-2050	2		2	GS-2050-BR-ENC	3000W 10Ω	100%	30A
460V	GS3-4020	1	GS-4DBU	1	GS-4020-BR-ENC	1500W 40Ω	125%	15A
	GS3-4025	1		1	GS-4025-BR-ENC	4800W 32Ω	125%	15A
	GS3-4030	1		1	GS-4030-BR-ENC	4800W 27.2Ω	125%	20A
	GS3-4040	1		1	GS-4040-BR-ENC	6000W 20Ω	125%	30A
	GS3-4050	1		1	GS-4050-BR-ENC	9600W 16Ω	125%	40A
	GS3-4060	1		1	GS-4060-BR-ENC	9600W 13.6Ω	125%	50A
	GS3-4075	2		2	GS-4075-BR-ENC	6000W 20Ω	125%	30A
	GS3-4100	2		2	GS-4100-BR-ENC	9600W 13.6Ω	125%	50A

Installation

Improper installation of the dynamic brake unit will greatly reduce its life. Be sure to observe the following precautions when selecting a mounting location.



WARNING: Failure to observe these precautions may damage the unit and void the warranty!

- Do not mount the dynamic brake unit near heat-radiating elements or in direct sunlight.
- Do not install the dynamic brake unit in a place subjected to high temperatures, high humidity, excessive vibration, corrosive gasses or liquids, or airborne dust or metallic particles.
- Mount the dynamic brake unit vertically and do not restrict the air flow to the heat sink fins.

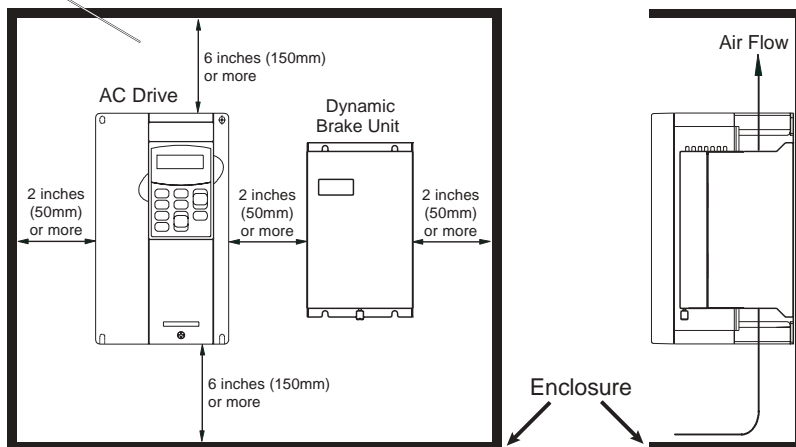


WARNING: The Dynamic Brake Unit and braking resistors can generate a large amount of heat which may damage the brake unit, resistors or any equipment mounted in the same enclosure as the heat producing devices. Auxiliary cooling methods are typically required in order not to exceed maximum ambient temperatures.

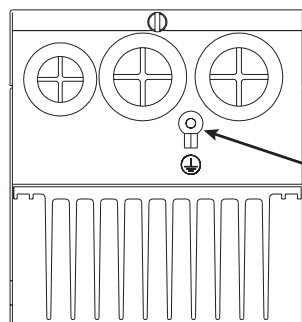
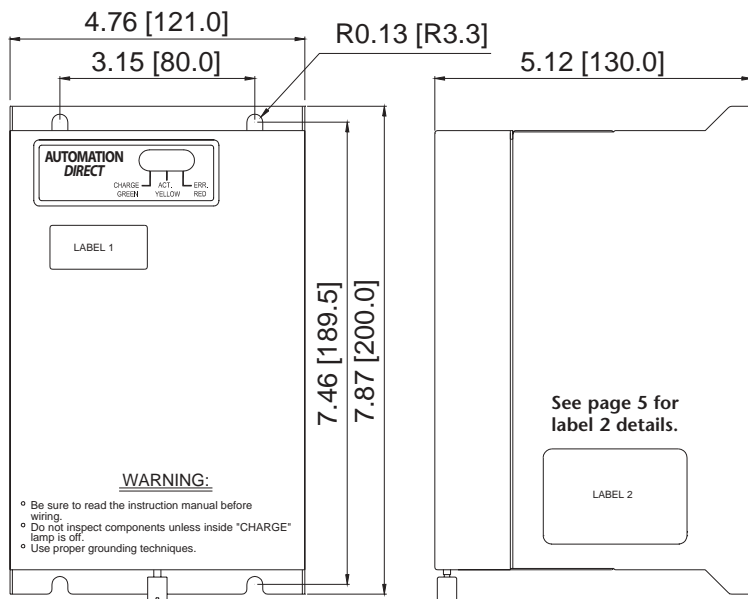
Minimum Clearances and Air Flow



MAXIMUM AMBIENT TEMPERATURES MUST NOT EXCEED 50°C (122°F)!



DIMENSIONS



Label 1 Details:

Braking Unit
GS-2DBU
230V 22kW

OR

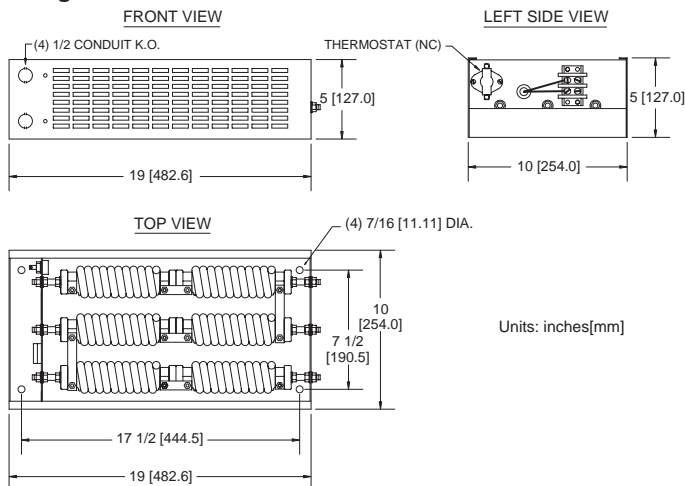
Braking Unit
GS-4DBU
460V 45kW

Grounding terminal
located on enclosure

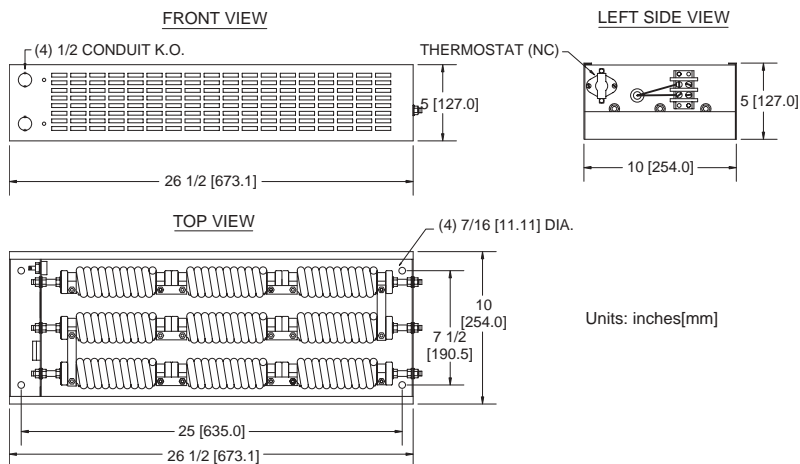
Units: inches[mm]

Dimensions Cont'd

Braking Resistor GS-2020-BR-ENC; GS-2040-BR-ENC = 2 units



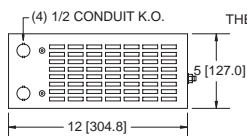
Braking Resistor GS-2025-BR-ENC, GS-2030-BR-ENC; GS-2050-BR-ENC = 2 units



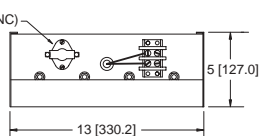
Dimensions Cont'd

Braking Resistor GS-4020-BR-ENC

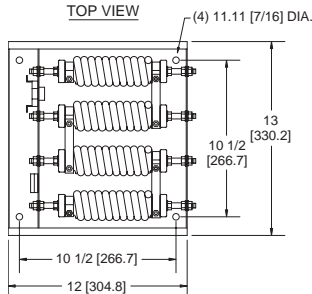
FRONT VIEW



LEFT SIDE VIEW



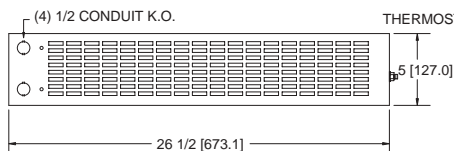
TOP VIEW



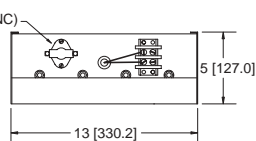
Units: inches[mm]

Braking Resistor GS-4025-BR-ENC, GS-4030-BR-ENC, GS-4040-BR-ENC GS-4075-BR-ENC = 2 units

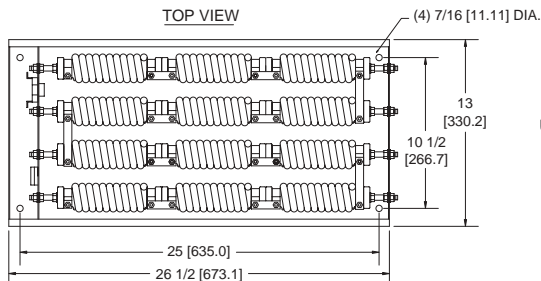
FRONT VIEW



LEFT SIDE VIEW



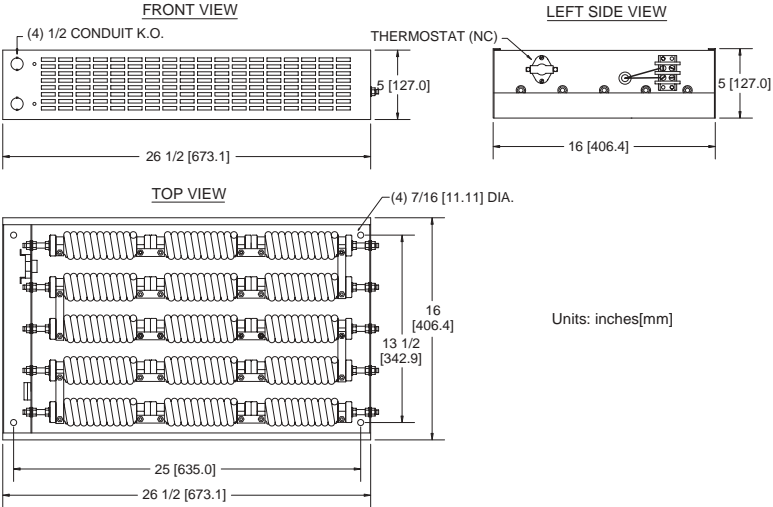
TOP VIEW



Units: inches[mm]

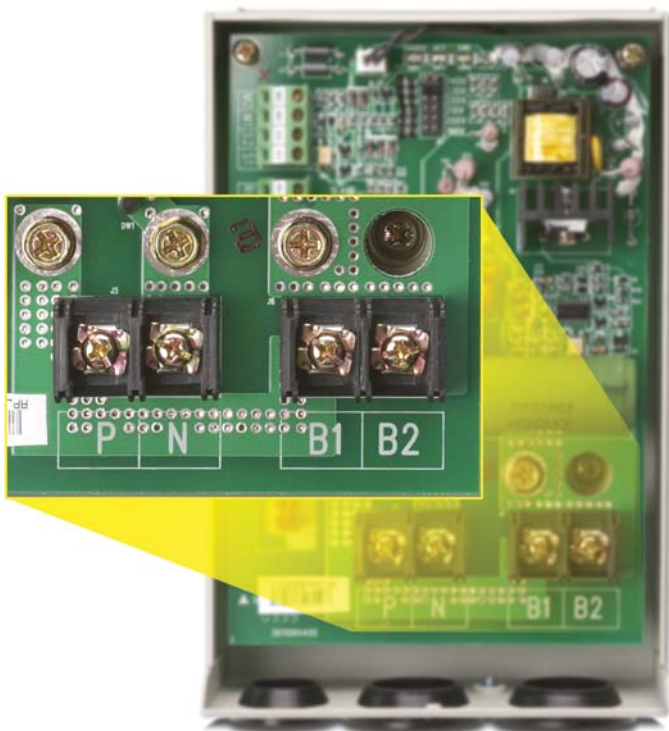
Dimensions Cont'd

Braking Resistor GS-4050-BR-ENC & GS-4060-BR-ENC GS-4100-BR-ENC = 2 units



Terminal Identification

Circuit	Terminal Mark	Wire Gauge AWG/mm ²	Terminal	Torque
Power Input Circuit	+ (P), - (N)	10 ~12AWG/3.5~5.5mm ²	M4 Screw	18 KG-CM
Braking Resistor	B1, B2			
Slave and Fault Circuit	M1, M2	20~18AWG/0.25~0.75mm ² M1, M2, S1, S2 with shielded wires	M2 Screw	4 KG-CM
	S1, S2			
	RA, RB, RC			



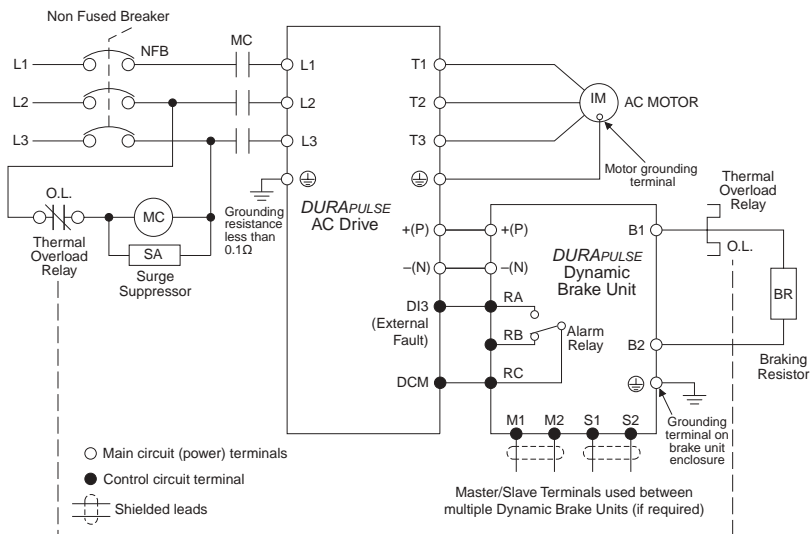
Note: Grounding terminal is located on the bottom outside of the Dynamic Brake Unit enclosure.

Terminal Identification Cont'd



Wiring

Basic Wiring Diagram



WARNING: For safety consideration, install an overload relay between the dynamic brake unit and the braking resistor. Use the overload relay normally closed contact wired in series with the coil of a magnetic contactor (MC). The contactor should be used to interrupt the power to the AC drive to prevent damage to the braking resistor in the case of excessive braking or in cases where the brake unit is forced to continuously operate due to unusual high input voltage.



WARNING: DO NOT wire terminal - (N) to the neutral point of the power system.

Wiring Considerations

- 1.) The alarm relay output contact terminals (RC, RA & RB) of the dynamic brake unit will be activated when the temperature of the brake unit heat sink exceeds 95°C (203°F). This condition can be caused by the ambient temperature surrounding the brake unit exceeding 50°C (122°F) or the 10% ED (Duty Cycle) is exceeded. If this situation exists, then the means to reduce the ambient temperature by the use of forced air cooling or some other means of reducing the ambient temperature should be considered.

Wiring Considerations Cont'd

- 2.) The *DURAPULSE* AC drive and Dynamic Brake Unit will be energized at the same time when power is applied to the drive. Please refer to the *DURAPULSE* AC Drive User Manual (GS3-M) to determine the start and stop operation of the motor. The Dynamic Brake Unit will monitor the internal DC bus voltage of the AC drive. When the AC drive stops the motor by decelerating, the brake unit will detect an increase in the drive's DC bus voltage due to the motor causing regeneration. The brake unit will then dissipate this excess energy into the braking resistor in the form of heat. Dissipating the regenerated energy from the DC bus will allow a stable and controlled deceleration of the motor.

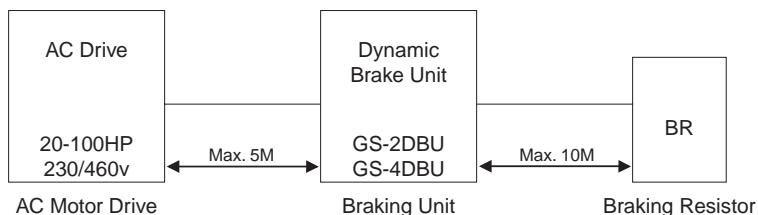
Wiring Notes: PLEASE READ PRIOR TO INSTALLATION.



WARNING: Do not attempt any wiring to the brake unit with power applied to the AC drive. This includes connecting or disconnecting any wiring, changing the brake unit's jumper settings, etc. Do not touch any of the brake unit's terminals or any component on the unit's PCB due to extremely dangerous high DC voltage being present.



WARNING: The wiring gauge and distance must comply with federal, state and local electrical codes. Please refer to the maximum wiring distances in the following block diagram.



WARNING: It is recommended that ring type crimp terminals be used for the main circuit wiring and the terminals be firmly fastened before power is applied to the brake unit.



WARNING: It is very important to confirm that the Dynamic Brake Unit's +(P) and -(N) terminals are connected by the correct polarity to the AC drive to prevent damage to both the AC Drive and the Dynamic Brake Unit before power is applied.

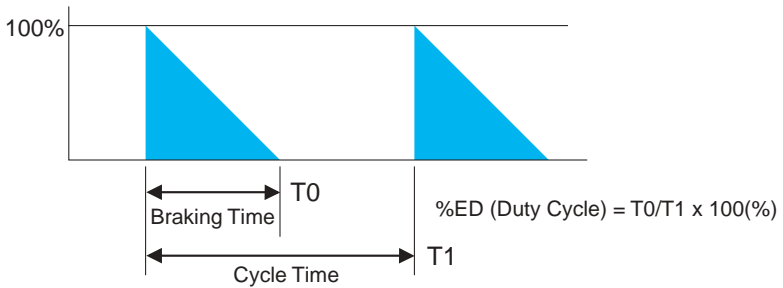


WARNING: During braking, because of the powerful electromagnetic field that is generated by the high current being switched through the brake unit, all control and low voltage wiring should be routed away from the brake unit power wiring.



WARNING: Make sure the ground terminal is connected to earth ground. The wire size must be at least the same size as the wiring connected to the +(P), -(N) terminals.

Brake %ED (Duty Cycle)



Explanation

Application of the dynamic brake unit needs to take into account how often the motor will be stopped during normal starting and stopping of the motor via the AC drive. The %ED (Duty Cycle) is a percentage determined by looking at how much time the brake is actually being used during deceleration in comparison to how much time has lapsed between each start of the motor. This %ED (Duty Cycle) percentage is required to allow the braking unit and braking resistor(s) to dissipate the heat created during dynamic braking. If the %ED (Duty Cycle) is exceeded, then the braking resistor will heat up causing the resistance to increase as the temperature rises and the effective braking torque would decrease accordingly.



Note: The maximum On-Time for the maximum 10% ED (Duty Cycle) is 60 seconds.

For example, if in a given application it is determined it will take 30 seconds for the motor to decelerate to a stop using dynamic braking, then the motor can only be cycled on and off continuously every 5 minutes (300 seconds).

$$30 / 300 \times 100 = 10\% \text{ ED (Duty Cycle)}$$

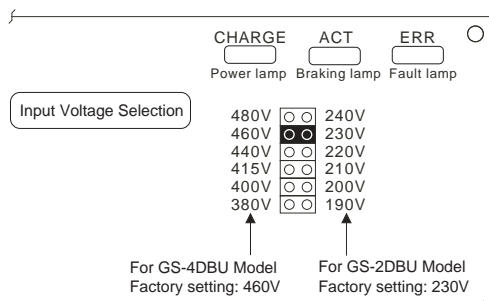
Brake Setup

Settings and Voltage Regulation:

The power source for the dynamic brake unit is the DC voltage provided from the + (P) and – (N) terminals of the AC drive DC bus. It is very important to set the power voltage jumper on the brake unit based on the input voltage of the AC motor drive before operating. The selection is important to the effective operation of the dynamic brake unit. Select the voltage value that is worse case. For example, if the nominal voltage is 380VAC, but the voltage may be up to 410VAC, then use the 415V input voltage jumper position. When using the dynamic brake unit with *DURAPULSE* AC Motor Drives, the “Over Voltage Stall Prevention” parameter, P 6.05, needs to be set to a “1” to disable this function because the dynamic brake unit will dissipate the regenerated voltage, but the voltage may slightly go over the voltage stall point. Refer to the following table.

AC Power Voltage Selection Chart			
230V Class AC Power Voltage	Braking Start-up voltage DC Bus (+ (P), – (N)) Voltage	460V Class AC Power Voltage	Braking Start-up voltage DC Bus (+ (P), – (N)) Voltage
190VAC	330VDC	380VAC	660VDC
200VAC	345VDC	400VAC	690VDC
210VAC	360VDC	415VAC	720VDC
220VAC	380VDC	440VAC	760VDC
230VAC	400VDC	460VAC	800VDC
240VAC	415VDC	480VAC	830VDC
Input Power Tolerance: $\pm 10\%$			

Voltage Setting Jumper:



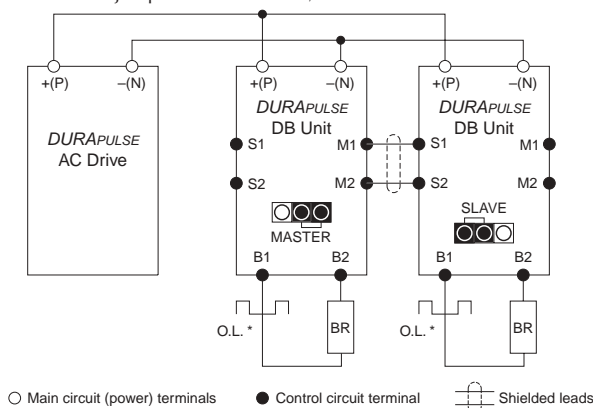
Note 1: Turn off power to equipment before changing the input voltage setting jumper!

Brake Setup Cont'd

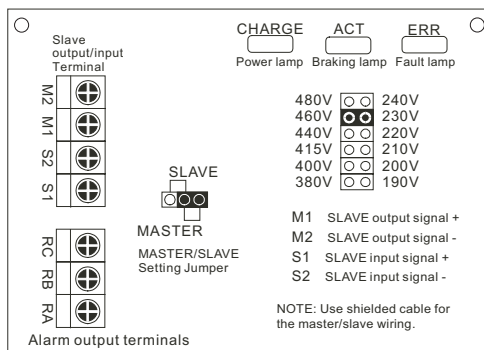
Master/Slave Wiring & Jumper Settings

The MASTER/SLAVE jumper on the brake unit has a factory default setting as a MASTER. If the application of the AC drive requires the use of more than one brake unit, then the power terminals of the units are wired in parallel and the first unit is set to MASTER while all other units are set to SLAVE. The jumper settings along with the wiring between the MASTER/SLAVE (M1, M2, S1 & S2) terminals allows the multiple brake units to synchronize the power dissipation between brake units. This assures each unit is dissipating an equivalent amount of energy to allow rapid deceleration of the motor.

Below is a wiring diagram example showing two dynamic braking units. The first unit has the jumper set to MASTER, while the other unit is set to SLAVE.



Jumper Positions

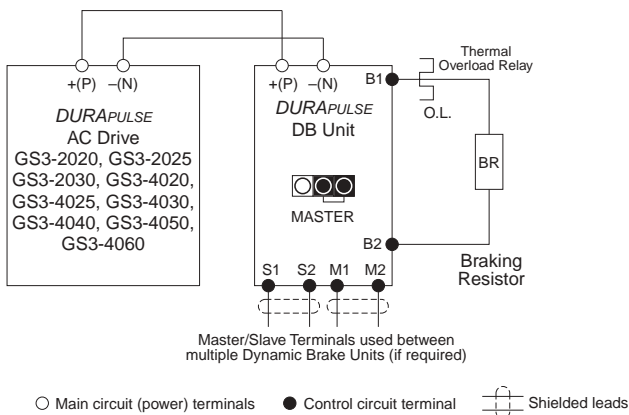


Dynamic Brake Unit Wiring Examples



WARNING: Before wiring the resistors to the dynamic brake unit(s), check the equivalent resistor values shown in the table on page 7 under the column heading “Resistor Specification for Each Braking Unit” and make sure the final value obtained matches this value. Damage to the dynamic brake unit and/or resistors and other equipment can result if the wrong resistance value is used.

AC Drives Requiring One (1) Dynamic Brake Unit 230VAC: 20HP/25HP/30HP & 460VAC: 20HP/25HP/30HP/40HP/50HP/60HP

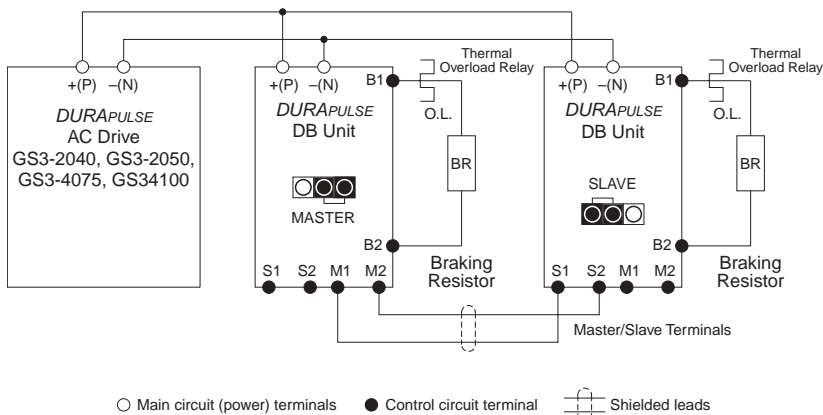


Note: See the table shown on page 7 of this user manual for the proper selection of DURA PULSE Dynamic Brake Unit and braking resistor part numbers.

AC Drives Requiring Two (2) Dynamic Brake Units

230VAC: 40HP/50HP &

460VAC: 75HP/100HP



Note: See the table shown on page 7 of this user manual for the proper selection of DURAPULSE Dynamic Brake Unit and braking resistor part numbers.

